

BLO O D VOCABULARY LIST

ADRENAL GLANDS Endocrine glands located on the top of each kidney that release the hormone called adrenalin.

AIDS An abbreviation for the disease called "Acquired Immune Deficiency Syndrome." This deadly disease, caused by the Human Immunodeficiency Virus or HIV, destroys the body's immune system.

ALVEOLI The tiny sacs in the lungs where the exchange of gases takes place between the blood and the air.

ANEMIA An illness marked by a reduction in the number of red blood cells or of properly functioning hemoglobin in the blood.

ANTIBODIES Immunoglobulin proteins that clump onto particular antigens in the process of fighting infectious diseases.

ANTIGEN A large foreign molecule, usually on the surface of a virus, that results in an "immune response," i.e., the production of antibodies by B-cell lymphocytes.

ANTIGEN: ANTIBODY COMPLEX A highly specific clumping reaction between a certain antigen and the specific antibody for that antigen.

ARTERY A thick-walled blood vessel that carries blood away from the heart.

ATHEROSCLEROSIS A thickening of the blood vessel walls due to a build-up of cholesterol.

B-CELLS A type of lymphocyte that produces the immunoglobulin proteins called antibodies.

BLOOD GROUPS Designated A, B, AB, and O, these blood groups indicate which antigens are present on the surface of the red blood cells. Blood group A has only A antigens, group B only B antigens, group AB has both A and B antigens, whereas group O has neither A or B antigens. The presence of these antigens means a person with type B blood cannot receive blood from a type A donor and vice-versa. Type AB individuals can receive blood from all the other blood groups, but people with type O blood can only receive blood from type O donors.

BLOOD PLASMA The liquid matrix of blood.

CAPILLARIES Very small thin-walled blood vessels.

CELL RESPIRATION The oxygen-consuming process used by cells to release energy from carbohydrate molecules.

CHOLESTEROL A chemical component of blood plasma that is employed in making cell membranes and certain hormones. Cholesterol can build up inside blood vessels causing partial or total blockage--a condition known as atherosclerosis.

CLOTTING FACTORS Chemicals produced by the platelets following an injury that cause the plasma protein fibrinogen to be converted into the threads of fibrin. Fibrin threads then help form a blood clot.

COMBUSTION A chemical oxidation process that occurs when wood is burned which is similar to cell respiration, because carbohydrates and oxygen are consumed and carbon dioxide, water, and energy are produced.

BLOOD

VOCABULARY LIST (CONTINUED)

ELECTROLYTE A general name for the inorganic salts present in the blood stream. Electrolytes and water must be properly balanced for blood cells to remain intact and healthy.

ENDOCRINE GLANDS Special organs that release hormones directly into the blood stream; also called the "ductless glands."

ERYTHROCYTES Red blood cells.

FIBRIN A substance formed from the plasma protein called fibrinogen that traps red blood cells to form a blood clot and then dries to form a scab.

FIBRINOGEN The plasma protein that forms the blood clotting substance called fibrin.

HELPER T-CELLS T-cell lymphocytes that cause B-cells to multiply and to make more antibodies.

HEMOGLOBIN An iron containing protein molecule found in great abundance in red blood cells that binds oxygen and carbon dioxide.

HIV An abbreviation for "Human Immunodeficiency Virus." This virus attacks the immune system, resulting in the disease known as AIDS.

HORMONES Chemical messenger molecules produced by the endocrine glands.

HYPERTENSION High blood pressure.

INFECTIOUS DISEASE A disease caused by viruses or by living organisms, such as bacteria, protozoa, or fungi.

IMMUNE RESPONSE The body's response to an infection, especially the production of antibodies by B-cell lymphocytes.

IMMUNE SYSTEM The system of defense against infectious diseases that is based on the white blood cells.

IMMUNITY A person is said to have an "immunity" to a particular illness if he or she can no longer catch that illness.

IMMUNOGLOBINS Antibody proteins used in fighting infectious diseases.

KILLER T-CELL A type of T-cell lymphocyte that destroys infectious organisms on contact.

LEUCOCYTES Another name for white blood cells.

LEUKEMIA A form of cancer of the blood in which many more white blood cells are produced than is healthy for the body.

LYMPH A pale-colored liquid that circulates through the vessels of the lymphatic system and contains all the components of blood except red blood cells. In particular, lymph contain huge numbers of lymphocytes and, as a result, is a very important component of the body's system of defense against infectious diseases.

BLOOD

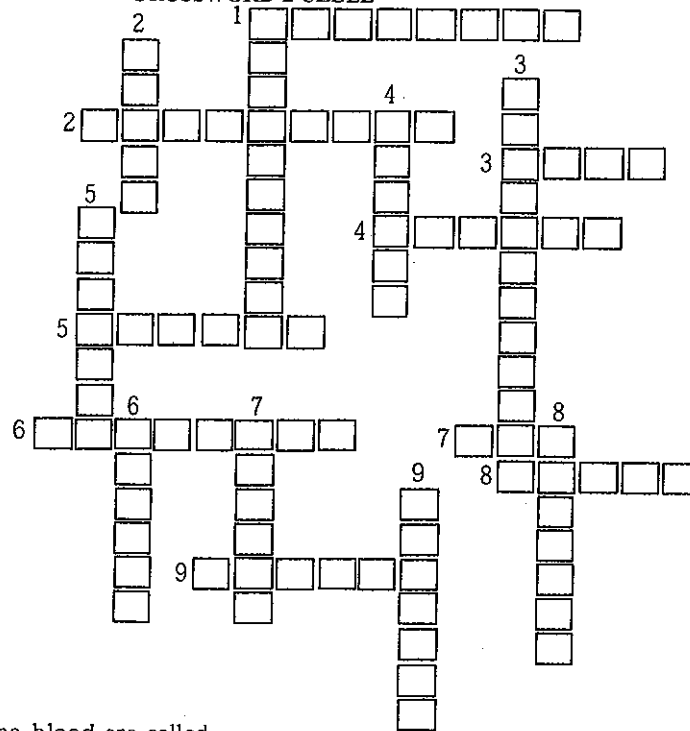
VOCABULARY LIST (CONTINUED)

- LYMPH NODES** Swellings of lymphatic tissue that filter the lymph and produce lymphocytes.
- LYMPHOCYTES** Non-phagocytic white blood cells that are also the predominant cells present in lymph.
- MEMORY CELLS** Lymphocytes that enable the immune system to combat that same antigen more effectively during future infections.
- MITOCHONDRIA** The subcellular organelles where cellular respiration occurs.
- PHAGOCYTIC WHITE BLOOD CELLS** A class of white blood cells that eat viruses and bacteria.
- PHAGOCYTOSIS** The process of "cell eating."
- PITUITARY GLAND** An endocrine gland located beneath the brain that releases many different hormones.
- PLATELETS** Cell fragments, also called thrombocytes, that release the clotting factors that cause fibrinogen to be converted into fibrin.
- RED BLOOD CELLS** Also called erythrocytes, cells that transport the respiratory gases oxygen and carbon dioxide. Red blood cells outnumber the white blood cells 700 to 1.
- Rh FACTOR** The so-called "Rhesus factor" blood antigen that is either present or absent in blood. The presence of the Rh factor in the blood of the developing child, if the mother is Rh negative, can cause complications during pregnancy.
- SICKLE CELL ANEMIA** A painful and often deadly genetic disease that results in the production of pointed or "sickle shaped" red blood cells.
- SPLEEN** An organ considered to be part of the lymphatic system that removes old red blood cells by causing them to disintegrate.
- STEM CELLS** Cells located in the bone marrow which can give rise to every type of blood cell as well to the cell fragments called platelets.
- SUPPRESSOR T-CELLS** Lymphocytes that cause other types of lymphocytes to lessen their immune responses.
- T-CELLS** Non-antibody producing lymphocytes that develop under the influence of the thymus gland. These cells make use of the surface proteins called T-cell receptors to react to antigens.
- THROMBOCYTES** Another name for platelets.
- THYMUS GLAND** A gland located in the chest that affects the way that lymphocytes develop.
- VACCINE** A substance made from dead or weakened viruses that, after it has been administered, results in an immunity to a particular disease.
- WHITE BLOOD CELLS** Also called leucocytes, they are lightly-colored cells present in the blood whose primary function is to fight disease. There are several different types of white blood cells, but only one white cell exists for every 700 red blood cells.

Name _____

BLOOD

CROSSWORD PUZZLE



ACROSS

1. Chemical messenger molecules carried in the blood are called _____.
2. A white blood cell is also called a _____.
3. The common name for Acquired Immune Deficiency Syndrome is _____.
4. The white blood cells that make it possible for our bodies to respond more effectively when confronted with a second infection by the same virus are called _____ cells.
5. White blood cells form the basis of the body's _____ system that is used in combatting infectious diseases.
6. A specific immunoglobulin protein produced by a B-cell is called an _____.
7. The Human Immunodeficiency Virus is commonly called _____.
8. Electrolytes in blood plasma are usually simple inorganic _____.
9. _____ T-cells cause the B-cell lymphocytes to multiply in response to an infection.

DOWN

1. The iron containing protein found in red blood cells is called _____.
2. A type of lymphocyte called a _____ can produce antibodies.
3. Some white blood cells eat invading bacteria--a process called _____.
4. Lymphocytes become T-cells under the influence of a gland in the chest called the _____ gland.
5. A foreign protein in the blood that causes antibodies to be produced is called an _____.
6. Suppressor _____ cause the immune responses of other lymphocytes to be lessened.
7. Red blood cells carry the respiratory gases _____ and carbon dioxide.
8. Immunity to a viral disease can be developed by receiving a _____ made from dead or weakened viruses.
9. Platelets are also called _____cytes.

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BLOOD SICKLE CELL ANEMIA

Hundreds of thousands of Africans and persons of African descent are currently afflicted with a debilitating blood disease called sickle cell anemia. Under the microscope, red blood cells taken from the victims of this disease, have a pointed appearance instead of the smooth disc shape possessed by normal red blood cells.

Because sickle cell anemia is the result of a mutation in the gene that makes hemoglobin (the protein molecule that carries oxygen in the blood stream), it can be transmitted from parent to child. However, because this gene is "recessive," the traits of the disease will be observed only if both parents carry the mutated gene, for even if one parent possesses the defective gene, the other parent will still supply the correct information for making normal hemoglobin.

The following steps result in sickle cell anemia:

1. A sickle cell mutation exists in the DNA of the hemoglobin gene of both parents. This means their children will receive a defective set of chromosomes from each parent.
2. Because of these paired identical mutations, an incorrect amino acid will be inserted into every hemoglobin molecule present in the child's red blood cells.
3. As a result of this single incorrect amino acid, every hemoglobin molecule will change its three dimensional shape.
4. Then, because red blood cells contain huge numbers of hemoglobin molecules, the red blood cells change from rounded to pointed shapes due to the fact that the mutated hemoglobin can only carry a reduced amount of oxygen.
5. Because of these changes, the red blood cells easily disintegrate or else get hung up moving through the tiny capillaries because they tend to clump together.
6. Consequently, tissues do not receive all the oxygen they need.
7. This results in a physical sensation of pain. Additionally, this disease can cause permanent disability and death.

(continued on Blackline Master 6)

BLOOD

SICKLE CELL ANEMIA (CONTINUED)

THE SICKLE CELL GENE AND "THE HETEROZYGOTE ADVANTAGE"

Geneticists have discovered a very interesting fact about this disease which may explain why the sickle cell gene is fairly prevalent in Africa, a continent where the disease called malaria, the leading cause of death worldwide, is very common.

If a person has received normal hemoglobin genes from each parent, that is, is homozygous for the normal hemoglobin gene, he or she has no resistance to malaria but, at the same time, has no anemia.

But if a person receives a normal hemoglobin gene from one parent and a defective sickle cell gene from the other parent, that person is said to be heterozygous for the sickle cell gene. People in this category suffer from very mild anemia, but amazingly possess resistance to the disease of malaria. Geneticists call this condition the Heterozygote Advantage, because a definite advantage--immunity to malaria--exists in having one sickle cell gene and one normal hemoglobin gene.

Persons who have received the defective sickle cell gene from each parent, however, are at a great disadvantage because they will likely die from the condition of sickle cell anemia.

HEMOGLOBIN DISTRIBUTION

	% of normal hemoglobin homozygotes	% of sickle-cell heterozygotes	frequency of sickle-cell homozygotes
African Blacks	82	18	.09
Black African- Americans	92	8	.04

Answer the following questions using this sheet or a separate sheet of paper.

1. True or False: Sickle cell anemia is more prevalent among African blacks than African-Americans.
2. What percentage of African blacks would be expected to have an immunity to malaria?
3. What percentage of African-Americans carry the gene for sickle cell anemia?
4. What percentage of African-Americans would be expected to have neither immunity to malaria nor sickle cell anemia?
5. True or False: If you were a black African child, you would be more likely to contract sickle cell anemia than become immune to malaria.

Name _____

BLOOD COMPONENTS OF BLOOD

PLASMA (55% of TOTAL VOLUME OF BLOOD)

<u>INGREDIENT</u>	<u>MAJOR FUNCTIONS</u>
WATER	Solvent for carrying other substances
ELECTROLYTES (SALTS)	Osmotic balance, buffering, regulation of membrane permeability
PROTEINS	Fibrinogens: blood clotting, fat escort proteins Immunoglobulin: defense (antibodies), albumin: buffering and osmotic balance

OTHER SUBSTANCES TRANSPORTED IN BLOOD PLASMA

NUTRIENTS (Sugars, fatty acids, vitamins, amino acids)	Food for cells
WASTES	By-products of metabolism
HORMONES	Chemical messengers produced by endocrine glands that affect cells in tissues far away from the glands
RESPIRATORY GASES	Oxygen, needed for cell-respiration, (Note: <u>Most</u> oxygen is transported by red blood cells). Carbon dioxide, a by-product of cell respiration

(continued on Blackline Master 8)

Name _____

BLOOD

COMPONENTS OF BLOOD (CONTINUED)

THE FORMED ELEMENTS (45% OF TOTAL VOLUME OF BLOOD)

FORMED ELEMENT	NUMBER (per cubic mm)	FUNCTIONS
RED BLOOD CELLS (Erythrocytes: one cell type, all the same size)	5-6 million	Transport oxygen and help transport carbon dioxide
WHITE BLOOD CELLS (Leucocytes: several different cell types of different sizes)	5-10 thousand	Defense and immunity
PLATELETS (Thrombocytes: small fragments of cells)	250-400 thousand	Blood clotting

Matching Exercise:

Directions: Match the correct term in Column B with the definitions in Column A.

Column A

- Hormones are transported by this component of blood. _____
- Cells that transport most respiratory gases. _____
- Cell fragments in blood that aid in blood clotting. _____
- The fewest cells present in blood. _____
- Plasma components that help maintain osmotic balance, membrane permeability and buffering. _____
- The major component of blood plasma. _____
- A major chemical by-product of cell respiration that contains no hydrogen. _____
- Amino acids are placed in this category of blood plasma components. _____
- Plasma proteins needed for blood clotting. _____
- Endocrine gland products. _____

Column B

- carbon dioxide
- water
- erythrocytes
- fibrinogens
- nutrients
- platelets
- plasma
- leucocytes
- hormones
- electrolytes

BLOOD QUIZ

Directions: Fill in the blanks with the correct answers.

1. Red blood cells do two things: they transport _____ and _____ in the blood stream.
2. The iron-containing protein called _____ is an essential ingredient in all red blood cells.
3. The watery matrix of blood is called _____.
4. Leucocytes is the scientific name for _____.
5. For blood to clot properly, the dissolved blood protein _____ must be exposed to the "clotting factors" released by the cell fragments called _____.
6. Some white blood cells actually eat invading bacteria and viruses. This process is called _____.
7. Both T-cells and B-cells belong to a class of white blood cells called _____.
8. The "T" in T-cell reflects the fact that it developed under the influence of a gland in the chest called the _____ gland, which begins with the letter "T."
9. B-cells produce the immunoglobulin proteins called _____ when viruses invade the body.
10. Proteins and other large molecules present on the outer coats of viruses, bacteria, and red blood cells are referred to by the general term _____.

TRUE OR FALSE

Directions: Place a "T" after the true statements and an "F" after the false statements.

1. Hormones are transported in the blood by red blood cells. _____
2. Electrolytes in the blood act as buffers, minimizing the changes in the acidity of the blood. _____
3. The blood loses most of its carbon dioxide in the lungs. _____
4. Persons with anemia usually suffer from too much oxygen in their blood. _____
5. Although cholesterol can be harmful, it is still needed to make cell membranes and certain hormones. _____
6. A person who obtained a sickle cell anemia gene from one parent and a normal gene from the other parent would probably not be affected by malaria. _____
7. Most people with AIDS rapidly recover if they are vaccinated against the HIV virus. _____
8. Blood is considered to be a connective tissue. _____
9. The HIV virus attacks the body's red blood cells. _____
10. Fibrin is a common component of blood clots. _____